

A Pediatric Cervical Spine Clearance Protocol to Reduce Radiation Exposure in Children

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INTRODUCTION

Pediatric cervical spine injuries are less common than adult cervical spine injuries and differ in the level of injury, type of injury and outcomes. Despite the differences, children are usually subjected to the same trauma work-up as adult patients for pediatric spine clearance which involves a complete cervical and upper thoracic spine CT image. CT of the cervical spine exposes radiation to children and carries a higher relative risk for developing malignancy in the future. An age-specific pediatric algorithm to evaluate cervical spine injuries was implemented at a level I trauma center in September of 2008.

OBJECTIVES:

To determine the effects of this protocol implementation and the reduction in radiation exposure to children (≤ 10 years)

METHODS

- A retrospective IRB approved study using our prospective institutional trauma registry database identified all pediatric (≤ 10 years) trauma patients from 1/2007 to 8/2011.
- Patients with outside hospital images were excluded from the protocol and the study.
- Patients were evaluated by physical exam alone, plain films, or with a cervical spine CT.
- Statistical analysis using STATA were used to perform chi-square, t-test, and p-value. P-value < 0.05 was defined as significant.
- WinDose Program was used to calculate radiation effective dose used in a cervical spine CT

RESULTS

Table 1. Demographic results of all pediatric trauma patients

Variable	Implementation of Protocol		P-value
	Pre (n=157)	Post (n=167)	
Age	4.65	4.82	0.6166
Sex	Male=101 Female=56	Male=89 Female=78	0.044
GCS	12.87	13.22	0.3921
ISS	10.81	11.24	0.7775
Head/Neck	0-2	122 (77.7%)	0.675
	3-5	35 (22.3%)	
Face	0-2	155(98.7%)	0.141
	3-5	2 (1.3%)	

Table 3. Comparison table of the effective doses of different organs between a full CT scan and a partial CT scan

Organ	Dose (mSv) Full Scan (to T3)	Dose (mSv) Partial Scan (to C3)
Thyroid	8.4	1.7
Skeleton	2.3	1.5
Skin	0.9	0.4
Bone Marrow	0.8	0.5
Esophagus	0.5	0.06
Effective Dose Equivalent	0.71	0.33

CONCLUSIONS

- There was a 60 % decrease in the use of full CTs after protocol implementation
- We estimated the protocol reduced radiation of the exposed area by 50% and decreased the radiation dose to the thyroid by greater than 80%.
- We extrapolated the combined effect resulted in a 3-fold reduction in radiation exposure
- Implementation of a cervical spine protocol led to a significant reduction in radiation exposure among children

Cervical Spine Clearance Algorithm for Children ≤ 10 Years of Age

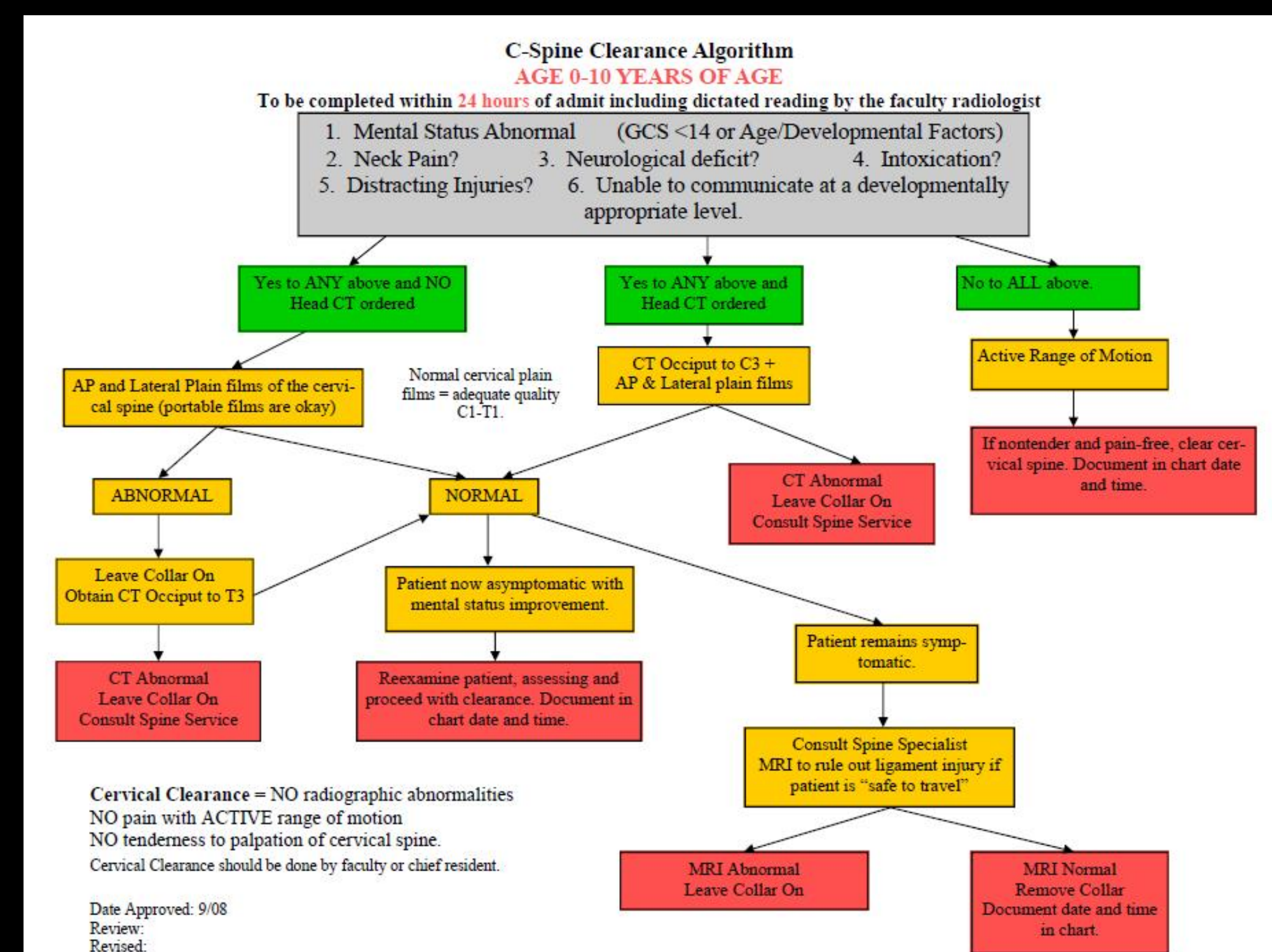
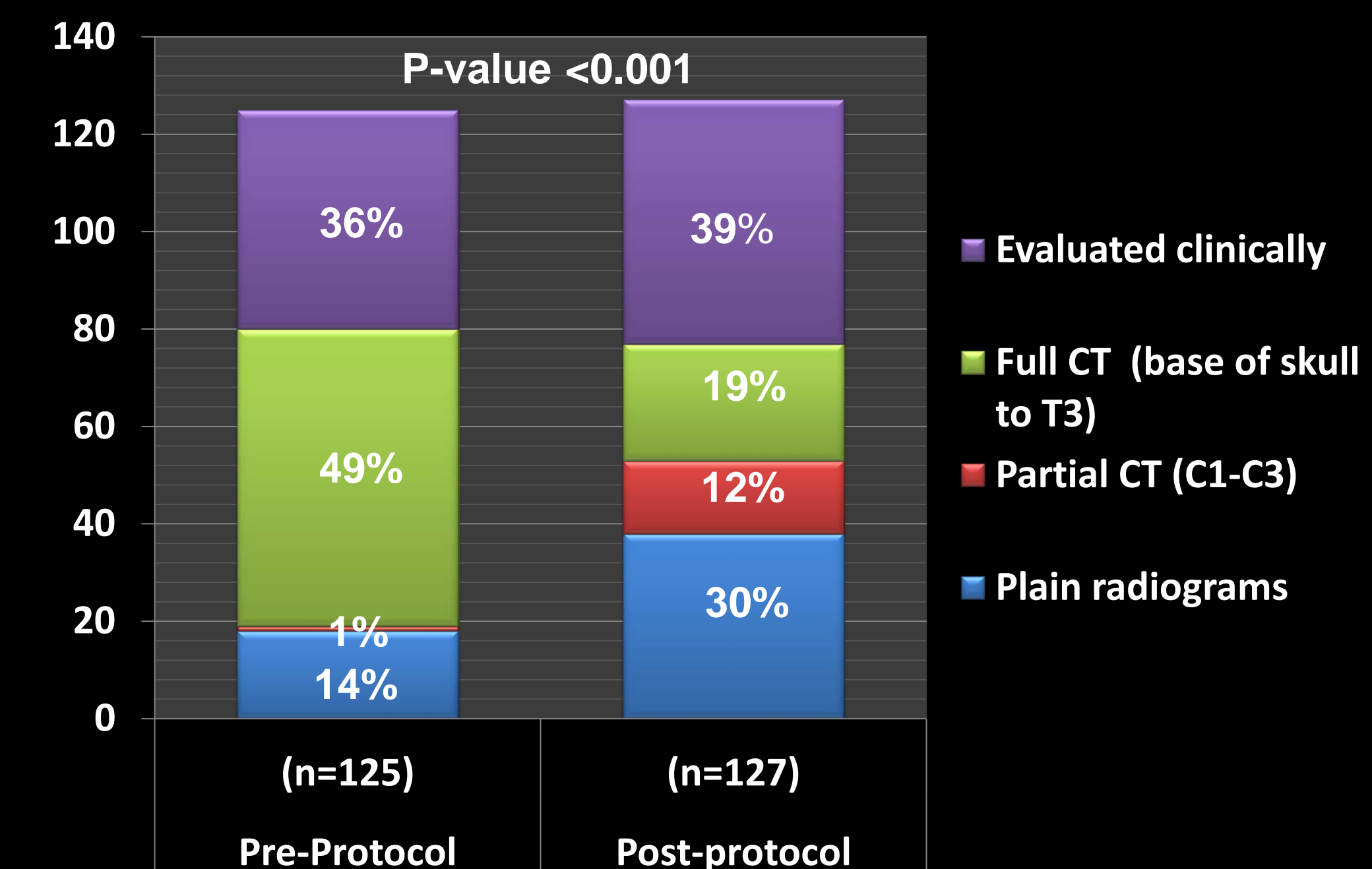


Table 2. Results of imaging modality between pre and post -protocol implementation



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